

REMARKS

Claims 1-13 are all of the claims currently pending in this application.

DRAWINGS:

The Examiner objects to the drawings under 37 C.F.R. §1.83(a) because he asserts that they fail to show a difference between Figure 3 and Figure 8. Namely, the Examiner states that these figures look the same and that Figure 8 does not illustrate an advantage over Figure 3.

Applicants submit the attached Substitute Figure 8, which further defines the previous Figure 8. As one skilled the art would appreciate, Substitute Figure 8 represents projected shapes of micro-mirror devices that have a reduced optical loss, as described on page 7 of the specification.

SPECIFICATION:

The Examiner objects to the disclosure and asserts that Applicants are required to explain why different formulae are used on pages 2 and 7 to calculate efficiency and optical loss. Applicants respectfully submit that different formulae are not used on these pages. Specifically, page 2 describes a formula that is used to calculate optical efficiency, as shown in lines 29 and 30. Page 7 does not repeat this equation. Instead, page 7 describes that a high optical efficiency of about 98% or greater is obtained when light is converged at 10° angles and has a tilt angle of 20°, in accordance with the present invention.

The Examiner also asserts that on page 2 after "...cos2..." a multiplication sign needs to be inserted. By the foregoing amendments, the mathematical expression referred to by the Examiner has been further defined. Applicants submit that one skilled in the art would be

appraised of the meaning of the expression. The objection to the specification is respectfully requested to be withdrawn.

35 U.S.C. §103:

The Examiner rejects claims 1-13 under 35 U.S.C. §103(a) as being unpatentable over Hornbeck (U.S. Patent No. 6,323,928 B1) in view of Tang et al. (U.S. Patent No. 5,025,346 [hereinafter “Tang”]). Applicants respectfully traverse this rejection in view of the following remarks.

The Examiner turns to Hornbeck and asserts that a majority of the claimed elements are disclosed. However, the Examiner acknowledges that Hornbeck does not show a mirror that is pivoted towards sides of a landing pad (see line 5 on page 4 and line 17 on page 5 of the Office Action). Accordingly, the Examiner refers to Tang and asserts that this reference teaches how to drive an actuator in parallel to a substrate. The Examiner then asserts that it would have been obvious to modify the invention of Hornbeck with the disclosure of Tang. Applicants respectfully submit that one skilled in the art would not have been motivated to modify Hornbeck in view of Tang to obtain the present invention.

To establish a *prima facie* case of obviousness, it must be established, amongst other things, that there is some suggestion or motivation to modify the primary reference or to combine the reference teachings. Further, the Examiner must show that the prior art references, when combined, teach or suggest all of the claimed features (see MPEP §2143).

Hornbeck is directed to a micro-mirror device that is disclosed as only pivoting towards corners of a dielectric insulation layer 328. (See for example, column 7, lines 57-67; and Fig. 4.) As recognized by the Examiner, there is no disclosure in Hornbeck of a mirror being pivoted towards sides of a landing pad. Tang fails to make up for the deficient teachings of Hornbeck.

The device of Tang is disclosed as being a microbridge device for use as a sensor or an actuator. The sensor is disclosed as being driven in parallel to a substrate. As shown in Figure 1, Tang discloses stationary electrodes 36 and 37 and a moveable finger 38. An electric field is formed between the electrodes and the moveable finger 38 (see column 5, lines 63-68). A bias voltage is provided between a drive port 21 and an electrode 22. Thus, the finger can be made to move towards the electrodes 36 and 37, and can be biased by elements 21 and 22.

There is no motivation to implement the device of Tang into the device of Hornbeck, nor is it clear how the sensor/actuator device of Tang would even be used in Hornbeck. Tang does not teach or suggest using the device with micro-mirror devices. At best, Tang teaches moving the comb-like fingers 38 in parallel with a substrate. However, there is no need for such comb-like fingers to be used in the invention of Hornbeck. Further, there is no need in Hornbeck for fingers to be moved in parallel with a substrate. Actually, because of the disclosure in Hornbeck of the posts 116, any sort of movement parallel to the substrate 304 (Figure 4) would be hindered.

Thus, Applicants respectfully submit that there is no motivation to combine the device of Tang with that of Hornbeck and, even if for some reason they were combined, the combination still would not teach the invention because the moving of any parts of Hornbeck in a direction that is parallel to the substrate in Hornbeck would not have taught or suggested a mirror that is pivoted towards sides of a landing pad by an electrostatic attraction between a pair of base electrodes and a mirror, as described in claims 1 and 10.

Consequently, claims 1 and 10 should patentable over Hornbeck in view of Tang, and the rejection of claims 1 and 10 under 35 U.S.C. §103(a) should be withdrawn. Dependent claims 2-9 and 11-13 are also patentable over these references at least by virtue of them being respectively dependent on independent claims 1 and 10.

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. SERIAL NO. 09/725,959

ART UNIT 2673
Q61266

Applicants' undersigned representative is desirous of conducting a personal interview with the Examiner in order to discuss the prior art rejection, as well as to obtain a better understanding of his position. Accordingly, the Examiner is respectfully requested to telephone the undersigned attorney upon receipt of the instant Amendment in order to schedule a personal interview at a mutually convenient date and time.

In view of the preceding amendments and remarks, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue that the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned attorney at the local telephone number listed below.

The USPTO is directed and authorized to charge all required fees (except the Issue Fee and/or the Publication Fee) to our Deposit Account No. 19-4880. Please also credit any over-payment to said Deposit Account.

Respectfully submitted,



Daniel V. Williams
Registration No. 45,221

SUGHRUE MION, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037-3213
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

Date: October 30, 2002

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Page 2, 1st full paragraph:

When the micro-mirror device having the above-described structure is adopted in an image display apparatus, a plurality of micro-mirror devices are arranged in a two-dimensional array structure, as shown in FIG. 2. The micro-mirror devices, arranged as described above, are driven around a rotating axis positioned on a diagonal line, resulting in shapes of the micro-mirror devices being projected as shown in FIG. 3, when viewed from a side of a light source that emits illuminating light to the micro-mirror devices 1. Specifically, FIG. 3 illustrates the shapes of the micro-mirror devices that are projected when light from the light source is converged at 10° angles and illuminated to the diagonally-driven micro-mirror devices 1 for an image display apparatus which pivots at ±10° angles, that is, which has a tilt angle of 20°. Compared to a tilt angle of 0° when parallel light beams are incident, the diagonally-driven micro-mirror device 1 has an optical efficiency of about 91%, which is obtained by taking the product of the cosine of the tilt angle and the square of the cosine of the convergence angle, i.e., $\cos(\text{tilt})$

AMENDMENT UNDER 37 C.F.R. §1.111
U.S. SERIAL NO. 09/725,959

ART UNIT 2673
Q61266

angle) \times [cos²(convergence angle)] cos²(convergence angle) = cos 20° \times [cos² 10°] cos²(20°).

Thus, an optical loss of about 9% is generated.

Applicants: Jong-woo SHIN, et al.
Serial: 09/725,959
Confirmation No. 8642
Filed: November 30, 2000
For: MICRO-MIRROR DEVICE...USING THE SAME

Docket Q61266
JU 2673
Exr. L. Shapiro

1 OF 1

Proposed Drawing Correction



FIG. 8

